

Opis delovnega mesta mladega raziskovalca/ke (Description of the Young Researcher's position)

1. Članica UL (UL member):

Fakulteta za gradbeništvo in geodezijo / Faculty of Civil and Geodetic Engineering

2. Ime, priimek in elektronski naslov mentorja/ice (Mentor's name, surname and email):

Nejc Bezak, nejc.bezak@fgg.uni-lj.si

3. Raziskovalno področje (Research field):

2.20 Vodarstvo (Hydrology)

4. Opis delovnega mesta mladega raziskovalca/ke (Description of the Young Researcher's position):

Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce.

slo:

Mladi raziskovalec oziroma mlada raziskovalka (MR) se bo usposabljal z raziskovalnim delom v okviru raziskovalnega programa P2-0180 Vodarstvo in geotehnika: orodja in metode za analize in simulacije procesov ter razvoj tehnologij. Program pokriva inženirske (tehniške) in naravoslovne vsebine, povezane z vodo in vodarstvom. V okviru dela na doktorski disertaciji in študiji na 3. stopnji bo MR sodeloval pri aktivnostih Unesco katedre za zmanjševanje tveganj ob vodnih ujmah (www.unesco-floods.eu) in drugih mednarodnih in domačih raziskovalnih projektih in strokovnih nalogah.

Prednost pri izbiri bodo imeli kandidati s poglobljenim znanjem s širšega področja hidrologije in željo po izvajanju eksperimentalnega dela (laboratorij ali/in terensko delo) in/ali razvojem naprednih modelov in statističnih analiz s tega področja. MR naj bi imel izkazano sposobnost za samostojno delo (samoiniciativnost), odlično znanje angleškega jezika (tako pisanje kot branje) in zanimanje za raziskovalno delo v naravi in/ali laboratoriju. MR bo deloval v krogu drugih mladih raziskovalnih sodelavcev in spoznal različne raziskovalne tehnike. Predviden je vpis ali na doktorski študijski program Grajeno okolje ali na program Varstvo okolja. Doktorska disertacija bo v dogovoru s kandidatom oz. kandidatko usmerjena ali v raziskovanje hidroloških procesov v naravnem okolju ali na reševanje inženirskih problemov s širšega področja hidrologije, oboje skladno s predznanji kandidata. Pričakovani profil MR je magistrska izobrazba na področju inženirskih znanosti (npr. vodarstvo, (okoljsko) gradbeništvo, inženirska geologija) ali naravoslovja (npr. uporabna fizika, uporabna matematika). Zaželeno je predznanje programskega jezika R (ali podobnih jezikov) in izkušnje z GIS orodji.

Tema doktorske naloge bo predvidoma usmerjena v področje uporabe zelene infrastrukture za obvladovanje tveganj povezanih z naravnimi nesrečami kot so poplave, suše, hudourniški izbruhi. Poudarek bo (glede na predznanja MR) na eni izmed naslednjih točk: i) eksperimentalno delo oziroma terenske meritve, ii) modeliranje oziroma statistične analize javno dostopnih hidro-meteoroloških podatkov, iii) razvoj in preskušanje uporabnosti in družbene sprejemljivosti izbranih zelenih ukrepov v povezavi z naravnimi nesrečami.

eng:

Young Researcher (MR) will be trained through research work in the framework of the Research Programme P2-0180 Water Science and Technology, and Geotechnical Engineering: Tools and Methods for Process Analyses and Simulations, and Development of Technologies. The Programme covers engineering (technical) and natural sciences aspects in the field of hydrology, water science and technology. As a part of the doctoral thesis and research conducted in the scope of the MR education the candidate will participate in the activities of the UNESCO Chair on Water-related Disaster Risk Reduction (www.unesco-floods.eu), and other international and national research and applied projects.

Preference will be given to candidates with in-depth knowledge of the broader field of hydrology and a desire to carry out experimental work (laboratory and/or field work) and/or to develop advanced models and statistical investigations in this scientific field. MR should have demonstrated ability for independent work (self-initiative), excellent knowledge of English (both writing and reading) and interest in research work in nature and/or laboratory. The MR will work in the circle of other young research associates and learn about various research techniques. Foreseen is the enrolment into the doctoral studies Built Environment or to Environment Protection. In agreement with the candidate, the dissertation will either focus on research of hydrological processes in natural environment or to solve engineering problems in the broader field of hydrology, both in accordance with the candidate's prior knowledge. Expected MR profile is a MSc degree in engineering sciences (e.g., water management, civil engineering, environmental engineering, engineering geology) or natural sciences (e.g., applied physics or applied

mathematics). Pre-knowledge of the R programming language (or similar) and experience with GIS tools are desirable.

The topic of the PhD thesis is expected to focus on the use of green infrastructure to manage risks related to natural disasters such as floods, droughts, and torrential outbursts. The focus will be (depending on the previous education and expertise of the MR) on one of the following points: i) experimental work or field measurements, ii) state-of-the-art modelling (small- or large-scale) or statistical analysis of available hydro-meteorological data, iii) development and testing of the applicability and social acceptability of selected green measures in relation to natural disasters.

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2. Ime, priimek in elektronski naslov mentorja/ice (*Mentor's name, surname and email*):

Boštjan Brank, bbrank@fgg.uni-lj.si

3. Raziskovalno področje (*Research field*):

Numerična mehanika / Monitoring stanja infrastrukturnega objekta
Computational mechanics / Structural health monitoring

4. Opis delovnega mesta mladega raziskovalca/ke (*Description of the Young Researcher's position*):

Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce.

Mladi raziskovalec bo delal na eni od naslednjih dveh tem:

- A. **Priprava numeričnih modelov za simulacijo nelinearnega in neelastičnega obnašanja konstrukcij in materialov.** Izpeljava teoretičnih modelov in računalniška implementacija pripadajočih algoritmov. Modeli se nanašajo pretežno na tankostenske ukrivljene konstrukcije, predvsem na opis nastanka in širjenja razpok in postopne popolne odpovedi konstrukcije.
- B. **Priprava in vzdrževanje digitalnih dvojčkov infrastrukturnih objektov.** Digitalni dvojčki se kreirajo s kombiniranjem izmerjenih podatkov, metodami umetne inteligence in metodo končnih elementov. Za kalibracijo numeričnega modela se uporabljajo verjetnostne metode.

Dodatni pogoji za zaposlitev mladega raziskovalca:

- Zaključena 2. stopnja gradbeništva, strojništva, računalništva, fizike ali matematike.

Želena znanja:

- Vsaj osnovno znanje slovenščine.
- Odlično znanje angleščine.
- Solidno znanje metode končnih elementov in numerične analize konstrukcij.
- Osnovne znanje s področja umetne inteligence.

The young researcher will work on one of the following two topics:

- A. **Preparation of numerical models for the simulation of non-linear and inelastic behavior of structures and materials.** Derivation of theoretical models and computer implementation of associated algorithms. The models refer mainly to thin-walled structures, mainly to the description of the formation and propagation of cracks and the gradual complete structural failure.
- B. **Preparation and maintenance of digital twins of infrastructure facilities.** Digital twins are created by combining measured data, artificial intelligence methods and the finite element method. Probabilistic methods are used to calibrate the numerical model.

Additional conditions for employment of a young researcher:

- Completed master degree in civil engineering, mechanical engineering, computer science, physics or mathematics.

Desired skills:

- At least basic knowledge of Slovenian.
- Excellent knowledge of English.
- Solid knowledge of the finite element method and numerical analysis of structures.
- Basic knowledge on artificial intelligence methods.

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2. Ime, priimek in elektronski naslov mentorja/ice (*Mentor's name, surname and email*):

Matjaž Dolšek, matjaz.dolsek@fgg.uni-lj.si

3. Raziskovalno področje (*Research field*):

Gradbeništvo / Civil Engineering

4. Opis delovnega mesta mladega raziskovalca/ke (*Description of the Young Researcher's position*):

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slo:

Delovno mesto mladega raziskovalca oz. mlade raziskovalke na področju gradbeništva/potresnega inženirstva vključuje interdisciplinarni pristop k raziskovanju, kar je v skladu z nedavno sprejeto resolucijo o krepitvi potresne varnosti do leta 2050. Glavni cilj je pripraviti družbo na bodoče potrese in zaščititi ljudi ter grajeno okolje, ob upoštevanju raznolikosti obstoječega stavbnega fonda in hitrega razvoja novih konstrukcijskih sistemov in materialov.

Mladi raziskovalec se bo usposabljal na doktorskem študiju Grajeno okolje na Fakulteti za gradbeništvo in geodezijo, Univerza v Ljubljani, z možnostjo izpopolnjevanja na uglednih institucijah po svetu. Tema doktorske disertacije mladega raziskovalca bo usklajena z raziskavami programske skupine Potresno inženirstvo (P2-0185), ki sodeluje v mednarodnih projektih in združenjih, kar bo zagotavljalo, da bodo raziskave aktualne in usklajene z raziskavami po svetu.

Raziskave mladega raziskovalca bodo usmerjene v eno izmed naslednjih tem: izboljšanje postopkov projektiranja novih objektov ali potresne utrditve obstoječih objektov, prispevanje k razvoju novega standarda za potresno odporno projektiranje konstrukcij Evrokod 8, razvoj postopkov za krepitev potresne varnosti v družbi, načrtovanje življenjske dobe objektov in s tem povezano projektno potresno obtežbo ter druge relevantne teme, ki so povezane s področjem krepitve potresne odpornosti družbe.

Kandidat mora izpolnjevati vse kriterije iz razpisa. Zaželeno je magistrska izobrazba s področja gradbeništva, ni pa nujna, ter izkazan interes za raziskovanje s področja potresnega inženirstva, gradbeništva ali drugih ved, ki jih povezuje potresno inženirstvo. Dodatne informacije lahko dobite na naslovu mdolsek@fgg.uni-lj.si.

eng:

The position of a young researcher in the field of civil engineering/earthquake engineering involves an interdisciplinary approach to research, aligning with the recently adopted resolution on strengthening earthquake safety by 2050. The primary goal is to prepare society for future earthquakes and protect people and built environments, considering the diversity of existing building stock and rapid development in new construction technology and materials.

The young researcher will undergo training within the doctoral program Built Environment at the Faculty of Civil and Geodetic Engineering, University of Ljubljana, with opportunities for further development at prestigious institutions worldwide. The topic of the young researcher's doctoral dissertation will be coordinated with the research conducted by the Earthquake Engineering research program (P2-0185), engaged in international projects and associations, ensuring that the research remains current and aligned with global efforts.

The research of the young researcher will focus on one of the following topics: improving procedures for designing new structures or retrofitting existing ones for seismic resilience, contributing to the development of new standards for the earthquake-resistant design of structure Eurocode 8, developing procedures to enhance seismic safety within society, designing the lifespan of structures and its associated design seismic actions, and other relevant topics related to strengthening societal earthquake resilience.

Candidates must meet all the criteria outlined in the call for applications. While a master's degree in civil engineering is preferred, it is not mandatory, provided the candidate demonstrates a keen interest in research related to seismic engineering, civil engineering, or related disciplines. For further information, please contact mdolsek@fgg.uni-lj.si.

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2. Ime, priimek in elektronski naslov mentorja/ice (*Mentor's name, surname and email*):

doc. dr. Robert Pečenko, robert.pecenko@fgg.uni-lj.si

3. Raziskovalno področje (*Research field*):

Mehanika (Engineering Mechanics)

4. Opis delovnega mesta mladega raziskovalca/ke (*Description of the Young Researcher's position*):

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slo:

Usposabljanje za pridobitev doktorata znanosti bo potekalo v okviru raziskovalne skupine Katedra za mehaniko in v sodelovanju z njihovimi industrijskimi in akademskimi partnerji v Sloveniji in tujini. Skupina proučuje mehanski ter toplotni odziv konstrukcij izpostavljenim požaru, kakor tudi stabilnost in dinamiko konstrukcij ter razvija nove modele in računske algoritme za reševanje aktualnih problemov na tem področju. Znotraj skupine gojimo široka znanja, uspešno izdelane metode in algoritme, ki predstavljajo dobro in trdno osnovo za raziskovalno delo mladega raziskovalca.

Mentor in raziskovalna skupina tako kandidatki ali kandidatu nudita odlične delovne pogoje za študij in raziskovalno delo, ustvarjalno, konkurenčno in prijateljsko ozračje in možnosti znanstvenih diskusij tudi z znanstveniki iz tujine ter primerno računalniško strojno in programsko opremo. Doktorsko delo bi bilo nadaljevanje in razširitev dosedanjih rezultatov raziskovalne skupine s poudarkom na aktualnih problemih pri modeliranju odziva lesenih konstrukcij izpostavljenim požaru.

Iščemo kandidatke in kandidate, ki jih zanima poglobljen študij in imajo ustrezna znanja na področju modeliranja, reševanja enačb in programiranja. Primerna izobrazba je zaključena druga stopnja gradbeništva, strojništva, matematike, fizike ali druge tehnične smeri z dovolj vsebin mehanike in modeliranja konstrukcij. Zaželeno je znanje programiranja, še posebej v okoljih kot sta Matlab in Python. Zahtevano je aktivno znanje angleškega jezika.

eng:

The PhD position is at the Research group Chair of Mechanics at Faculty of Civil and Geodetic Engineering, University of Ljubljana. The group investigates the response of structures exposed to fire as well as stability and dynamics of structures and develops new models and numerical formulations for structural mechanics. The wide knowledge and research results within the research group represent an excellent starting point for the early-stage researcher – doctoral student.

The supervisor and his research group offer the candidate excellent working conditions for study and research work, creative, competitive and friendly environment and opportunities for scientific discussions within the group and wider and appropriate research equipment and software. The doctoral thesis would be a continuation and extension of the previous results of the research group with an emphasis on the present challenges in modelling of timber structures exposed to fire.

We are looking for candidates who are interested in study challenges and have relevant knowledge in the field of modelling, equation solving and programming. Appropriate background is the completion of the second level studies in civil engineering, mechanical engineering, mathematics, physics or similar with sufficient content of engineering mechanics and structural modelling. Programming skills are highly desirable, in particular experiences with Matlab or Python. High standard of spoken and written English is required.

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2. Ime, priimek in elektronski naslov mentorja/ice (*Mentor's name, surname and email*):

Sara Piculin, sara.piculin@fgg.uni-lj.si

3. Raziskovalno področje (*Research field*):

2.01 Gradbeništvo (*Civil Engineering*)

4. Opis delovnega mesta mladega raziskovalca/ke (*Description of the Young Researcher's position*):

Vključuje morebitne dodatne pogoje, ki jih mora izpolnjevati kandidat/ka za mladega raziskovalca/ko, ki niso navedeni v razpisu za mlade raziskovalce.

slo: Bodoči mladi raziskovalec/ka bo raziskovalno delo opravljal/a v okviru raziskovalne skupine Gradbene konstrukcije in gradbena fizika, ki pokriva področje numeričnega in eksperimentalnega modeliranja ter projektiranja jeklenih, masivnih in lesenih konstrukcij. Bodoči pristopi k načrtovanju konstrukcij bodo zahtevali materiale oziroma konstrukcijske sisteme, ki se bodo aktivno odzivali v času in prostoru na dane obremenitve. Razvoj metod na področju 3D tiska kovin odpira nove možnosti aplikacije sodobnih tehnologij v konstrukcijah, zlasti v smislu namensko zasnovane notranje strukture, ki omogoča optimalne lastnosti konstrukcije in konstrukcijskih elementov glede na njihov namen. Sodobno gradbeništvo vključuje uporabo metamaterialov in funkcionalno gradientnih materialov ter pametnih materialov in konstrukcij. Razvoj novih materialov in konstrukcij je tesno povezan z metodami umetne inteligence, ki so trenutno v samem središču razvoja numeričnih metod, saj predstavljajo osnovo visokotehnoloških rešitev. Usposabljanje bodočega mladega raziskovalca/ke bo zajemalo zgoraj naštetih sodobnih metod in tehnologij, od uporabe naprednega numeričnega modeliranja ter metod umetne inteligence, do eksperimentalnega dela v laboratoriju in 3D tiska jeklenih konstrukcijskih elementov.

Programska skupina je ena vodilnih raziskovalnih skupin na področju razvoja tehničnih standardov in eksperimentalnih metod pri analizi konstrukcijskih rešitev, kar bo dobra osnova za doseg zastavljenih ciljev. Dolgoletno sodelovanje z evropskim tehničnimi univerzami, kot so Univerzi v Pavii, Tehniška univerza v Delftu, Univerza v Budimpešti, Univerza v Stuttgartu, center za numerično modeliranje na Univerzi v Hannoveru, idr. bo dalo kandidatu/ki možnost izvedbe dela usposabljanja v tujini. Splošnost uporabljenih numerično-eksperimentalnih metod ter široka znanja v programski skupini, bodo omogočala kandidatu/ki, da si, v dogovoru z mentorjem, izbere konkretne cilje in poudarke raziskav, ki bodo tako lahko osnova tudi za kandidatovo bodočo strokovno ali raziskovalno kariero. Vabljeni so kandidati/ke s področja tehnike ali naravoslovja.

eng: The future young researcher will carry out his/her research work in the research group Building Structures and Building Physics, which covers the field of numerical and experimental modeling and design of steel, concrete and timber structures. Future approaches to structural design require materials or structural systems that will actively respond in time and space to given loads. The development of methods in the field of 3D printing of metals opens up new possibilities for the use of modern technologies in structures, especially in the production of materials and structures whose internal structure is specifically designed to have optimal properties depending on their purpose. Today's construction industry includes the use of metamaterials, functionally gradient materials and intelligent materials and structures. The development of new materials and structural elements is closely linked to artificial intelligence methods, which are currently at the center of the development of numerical methods, as they represents the basis of high-tech solutions. The training of the future young researcher includes the use of advanced numerical modelling, artificial intelligence methods, experimental work in the laboratory and 3D printing of metal.

The research group is one of the leading research groups in the field of development of technical standards and experimental methods in the analysis of structural systems, which will be a good basis for achieving the set goals. Long-term collaborations with some of the leading European technical universities, such as the University of Pavia, Delft University of Technology, Budapest University of Technology and Economics, University of Stuttgart, the centre for numerical modeling at the University of Hannover and others will give the candidate the opportunity to complete part of the training abroad. The generality of the numerical-experimental methods used as well as the broad knowledge in the research group allow the candidate to choose specific goals and focuses

of research in consultation with the mentor. The mentioned can be the basis for the candidate's future professional or research career. Candidates in the field of engineering or natural sciences are invited.

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2. Ime, priimek in elektronski naslov mentorja/ice (*Mentor's name, surname and email*):

Oskar Sterle, oskar.sterle@fgg.uni-lj.si

3. Raziskovalno področje (*Research field*):

Geodezija / Geodesy

4. Opis delovnega mesta mladega raziskovalca/ke (*Description of the Young Researcher's position*):

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slo:

Mlada raziskovalka (mladi raziskovalec) bo delovala (deloval) na Katedri za matematično in fizikalno geodezijo ter navigacijo Oddelka za Geodezijo UL FGG, znanstveno usposabljanje pa bo izvedeno v okviru raziskovalnega programa Dinamična Zemlja (P1-0419), ki ga sestavljajo raziskovalci Geološkega zavoda Slovenije in en raziskovalec Oddelka za geodezijo UL FGG. Znanstveno področje raziskovalne skupine je usmerjeno v spremljanje, analiziranje in modeliranje dinamičnih procesov Zemlje, od aktivne globalne, regionalne in lokalne tektonike, potresnih mehanizmov, pobočnih masnih premikov in drugih površinskih procesov.

Znanstveno-raziskovalno delo mlade raziskovalke (mladega raziskovalca) bo usmerjeno v poglobljen študij geodetskih metod za potrebe spremljanja deformiranja Zemeljskega površja in analize stanja Zemljine atmosfere. Za kakovostno določitev in opredelitev dinamičnih procesov Zemlje je potrebno kakovostno določanje položajev karakterističnih točk in njihovih sprememb skozi čas. Obravnava položaja mora biti opredeljena znotraj modernega časovno odvisnega referenčnega sistema, ki temelji na tehnikah satelitske geodezije in daljinskega zaznavanja. Kandidatka (kandidat) bo znanje pridobila (pridobil) v okviru doktorskega študija, pri sodelovanju v aplikativnih in znanstvenih projektih, sodelovanja v multidisciplinarni skupini raziskovalcev Oddelka za geodezijo in Geološkega zavoda Slovenije in pri vključevanju v mednarodno okolje znanstvenih raziskav.

Iščemo kandidatko ali kandidata, ki jo/ga zanima poglobljen študij geodetskih metod določanja položaja geodetskih točk in njihovih sprememb skozi čas, za spremljanje in modeliranje dinamičnih procesov Zemlje. Zaželeno je znanje programiranja za reševanje matematičnih in fizikalnih problemov, kot sta to Matlab in Python. Zahtevano je aktivno znanje angleškega jezika. Pričakuje se odgovornost in samoiniciativnost, predvsem pa odprtost za delo v skupini.

eng:

The Young Researcher will work at the Chair of Mathematical and Physical Geodesy and Navigation, Department of Geodesy UL FGG, however the scientific training will be carried out within the framework of the research programme Dynamic Earth (P1-0419), a programme that consists of researchers from Geological

Survey of Slovenia and one researcher from Department of Geodesy UL FGG. Scientific field of the research group focuses on monitoring, analysing and modelling of the Earth's dynamic processes; i.e. active global, regional and local tectonics, earthquake mechanisms, slope mass movements and other surface processes.

The scientific work of the young researcher will be focused towards an in-depth study of geodetic methods for monitoring the deformation of the Earth's surface and analysis of the Earth's atmosphere. To determine and define dynamic processes of the Earth with high quality, one must determine the positions of characteristic points and their changes in time. Positions of points must be determined within a modern time-dependent reference systems that are based on satellite geodesy and remote sensing. The candidate will acquire necessary background knowledge through doctoral studies, participation in applied and scientific projects, and participation in a multidisciplinary group of researchers of the Department of Geodesy and the Geological Survey of Slovenia, with an integration into the international environment of scientific research.

We are looking for a candidate who is interested in an in-depth study of geodetic methods for determining the position of geodetic points and their changes over time, for monitoring and modelling the Earth's dynamic processes. Programming skills, in particular Matlab and Python, for solving mathematical and physical problems are desirable. Higher level of spoken and written English is required. The applicant should be responsible, show initiative, and be open for working in a dynamic team.